

CLAIMS

1. A system for estimating the temporal validity of location reports through pattern analysis, said system comprising:
 - a. a mode selector identifying a data analysis mode, said data analysis mode being an online mode when immediate analysis of location data is to be performed, and said data analysis mode being a batch mode when data analysis is triggered either manually or periodically;
 - b. a receiver receiving location records from one or more tracked entities and storing said location records in one or more databases;
 - c. an analysis trigger triggering data analysis tasks based upon said identified data analysis mode, said analysis trigger responsible for periodically forwarding to a classifier received location data in said batch mode, and said analysis trigger forwarding said received location data onto said classifier in said online mode;
 - d. said classifier clustering and partitioning location data, and said classifier, in an online mode, receiving a single location data from a tracked entity and repartitioning already partitioned data in said databases corresponding to said tracked entity and based upon said received location data, and said classifier, in a batch mode, clustering and repartitioning location data in said databases corresponding to a tracked entity upon a request from said analysis trigger, and
 - e. an expiration time analyzer performing pattern analysis and estimating expiration times associated with each of said repartitioned data computed by said classifier,

21 said expiration times providing a measure of the degradation of location reports
22 over a period of time.

- 1 2. A system for estimating the temporal validity of location reports through pattern
2 analysis, as per claim 1, wherein said expiration time analyzer further comprises:
3 a. a time interval analyzer identifying several frequent time intervals between
4 location reports in a cluster using a logarithmic time interval scale, and
5 b. an expiration time extractor identifying an optimal expiration time from said
identified intervals based upon a threshold.
3. A system for estimating the temporal validity of location reports through pattern
analysis, as per claim 1, wherein said system communicates with said tracked entities
via simple object access protocol (SOAP).
4. A system for estimating the temporal validity of location reports through pattern
analysis, as per claim 1, wherein said system reduces required communication
bandwidth by inhibiting transmission of location data during said estimated expiration
times.
- 1 5. A method for increasing confidence for tracking information originating from one or
2 more location positioning modules, said method comprising:
3 a. receiving location reports from said one or more location positioning modules;
4 b. storing said location reports in one or more databases;

- c. creating N optimal partitions for location reports corresponding to each of said location positioning modules;
- d. identifying via pattern analysis an expiration time associated with each of said created partitions, and
- e. utilizing said identified expiration times corresponding to each of said location positioning modules to identify an expiration time and placing increased confidence in location reports corresponding to said identified expiration time.

- 6. A method for increasing confidence for tracking information originating from one or more location positioning modules, as per claim 5, wherein said step of identifying an expiration time further comprises the steps of:
 - a. identifying several frequent time intervals between location reports in a cluster using a logarithmic time interval scale, and
 - b. identifying an optimal expiration time from said identified intervals based upon applying a threshold T.

- 7. A method for increasing confidence for tracking information originating from one or more location positioning modules, as per claim 5, wherein said tracked entities communicate via a simple object access protocol (SOAP).

- 8. A method for increasing confidence for tracking information originating from one or more location positioning modules, as per claim 5, wherein said method reduces

3 required communication bandwidth by inhibiting transmission of location data during
4 said estimated expiration times.

1 9. An article of manufacture comprising a computer usable medium having computer
2 readable program code embodied therein which increases confidence for tracking
3 information originating from one or more location positioning modules, said article
4 comprising:

- 5 a. computer readable program code receiving location reports from said one or more
6 location positioning modules;
7
8 b. computer readable program code storing said location reports in one or more
9 databases;
10
11 c. computer readable program code creating N optimal partitions for location reports
12 corresponding to each of said location positioning modules;
13
14 d. computer readable program identifying via pattern analysis an expiration time
15 associated with each of said created partitions, and
16
17 e. computer readable program code utilizing said identified expiration times
18 corresponding to each of said location positioning modules to identify an
19 expiration time and placing increased confidence in location reports
20 corresponding to said identified expiration time.

1 10. An article of manufacture comprising a computer usable medium having computer
2 readable program code embodied therein which increases confidence for tracking

information originating from one or more location positioning modules, as per claim 9, wherein said article further comprises:

- a. computer readable program code identifying several frequent time intervals between location reports in a cluster using a logarithmic time interval scale, and
- b. computer readable program code identifying an optimal expiration time from said identified intervals based upon applying a threshold T.

11. A method for triggering a tracking application based upon expiration information associated with a tracked entity, said method comprising:

- a. collecting location related information from said tracked entity;
- b. storing said collected location related information in one or more databases;
- c. clustering said stored location related information into one or more clusters;
- d. partitioning each of said clusters into N optimal partitions;
- e. identifying an expiration time associated with each of said partitions;
- f. monitoring time interval between reports from said tracked entity to identify intervals that exceed said identified expiration time for any of said partitions, and
- g. triggering said tracking application if said monitored time interval exceeds identified expiration time in any of said partitions.

12. A method for triggering a tracking application based upon expiration information associated with a tracked entity, as per claim 11, wherein said method further comprises the steps of:

- 4 a. identifying several frequent time intervals between location reports in a cluster
5 using a logarithmic time interval scale, and
6 b. identifying an optimal expiration time from said identified intervals based upon a
7 threshold.
- 1 13. A method for triggering a tracking application based upon expiration information
2 associated with a tracked entity, as per claim 11, wherein said tracked entities
3 communicate via a simple object access protocol (SOAP).
- 4 14. A method for triggering a tracking application based upon expiration information
5 associated with a tracked entity, as per claim 1, wherein said method reduces required
6 communication bandwidth by inhibiting transmission of location data during said
7 estimated expiration times.
- 8 15. An article of manufacture comprising a computer usable medium having computer
9 readable program code for triggering a tracking application based upon expiration
information associated with a tracked entity, said article comprising:
- 10 a. computer readable program code collecting location related information from said
11 tracked entity;
12 b. computer readable program code storing said collected location related
13 information in one or more databases;
14 c. computer readable program code clustering said stored location related
15 information into one or more clusters;

- 10 d. computer readable program code partitioning each of said clusters into N optimal
11 partitions;
- 12 e. computer readable program code identifying an expiration time associated with
13 each of said partitions;
- 14 f. computer readable program code monitoring time interval between reports from
15 said tracked entity to identify intervals that exceed said identified expiration time
16 for any of said partitions, and
- 17 g. computer readable program code triggering a tracking application if said
18 monitored time interval exceeds identified expiration time in any of said
19 partitions.
- 20 16. An article of manufacture comprising a computer usable medium having computer
21 readable program code for triggering a tracking application based upon expiration
22 information associated with a tracked entity, as per claim 15, wherein said article
23 further comprises:
- 24 a. computer readable program code identifying several frequent time intervals
25 between location reports in a cluster using a logarithmic time interval scale , and
26 b. computer readable program code identifying an optimal expiration time from said
27 identified intervals based upon a threshold.

- 1 17. A method for providing a measure of degradation associated with location reports
2 over a period of time, said location reports corresponding to one or more tracked
3 entities, said method comprising:
- 4 a. setting a counter to point to first of said tracked entities;
- 5 b. identifying one or more clusters associated with tracked entity pointed by said
6 counter;
- 7 c. creating N optimal partitions for each of said identified clusters;
- 8 d. identifying an optimal expiration time associated with each of said partitions via
time interval analysis;
- 9 e. incrementing said counter to point to next of said tracked entities and repeating
10 steps b-d exhaustively for remainder of said tracked entities;
- 11 f. increasing confidence in location information reported by each of said tracked
12 entities based upon said identified expiration times.
- 13 18. A method for providing a measure of degradation associated with location reports
14 over a period of time, as per claim 17, wherein said method further comprises the
15 steps of:
- 16 a. identifying several frequent time intervals between location reports in a cluster
17 using a logarithmic time interval scale, and
- 18 b. identifying an optimal expiration time from said identified intervals based upon a
19 threshold.

- 1 19. A method for providing a measure of degradation associated with location reports
2 over a period of time, as per claim 17, wherein said tracked entities communicate via
3 a simple object access protocol (SOAP).
- 1 20. A method for providing a measure of degradation associated with location reports
2 over a period of time, as per claim 17, wherein said method reduces required
3 communication bandwidth by inhibiting transmission of location data during said
4 estimated expiration times.
- 1 21. A method for estimating the temporal validity of location reports through pattern
2 analysis, said method comprising:
3
4 a. identifying a data analysis mode, said data analysis mode being an online mode
5 when immediate analysis of location data needs to be performed, and said data
6 analysis mode being a batch mode when periodic analysis of data needs to be
7 performed;
8
9 b. receiving location records from one or more tracked entities and storing said
10 location records in one or more databases;
11
12 c. triggering data analysis tasks based upon said identified data analysis mode, said
analysis trigger responsible for periodically forwarding, to a classifier, received
location data in said batch mode, and said analysis trigger forwarding said
received location data onto said classifier in said online mode;

- 13 d. clustering and partitioning location data and said classifier, in an online mode,
14 receiving a single location data from a tracked entity and repartitioning already
15 partitioned data in said databases corresponding to said tracked entity and based
16 upon said received location data, and said classifier, in a batch mode, clustering
17 and repartitioning location data in said databases corresponding to a tracked entity
18 upon a request from said analysis trigger, and
- 19 e. estimating expiration times associated with each of said repartitioned data
20 computed by said classifier, said expiration times providing a measure of the
21 degradation of location reports over a period of time.
22. A method for estimating the temporal validity of location reports through pattern
analysis, as per claim 21, wherein said method further comprises the steps of:
- a. identifying several frequent time intervals between location reports in a cluster
using a logarithmic time interval scale, and
- b. identifying an optimal expiration time from said identified intervals based upon a
threshold.
23. A method for estimating the temporal validity of location reports through pattern
analysis, as per claim 21, wherein said tracked entities communicate via a simple
object access protocol (SOAP).
24. A method for estimating the temporal validity of location reports through pattern
analysis, as per claim 21, wherein said method reduces required communication

3 bandwidth by inhibiting transmission of location data during said estimated expiration
4 times.

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